



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,173	10/06/2006	Hiroyuki Ochiai	283229US2X PCT	1447
22850	7590	03/30/2010		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER HORNING, JOEL G	
			ART UNIT 1792	PAPER NUMBER
			NOTIFICATION DATE 03/30/2010	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary

Application No.

10/560,173

Applicant(s)

OCHIAI ET AL.

Examiner

JOEL G. HORNING

Art Unit

1792

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 52-76 is/are pending in the application.
- 4a) Of the above claim(s) 52-55, 59-71 and 74-76 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 56-58, 72 and 73 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 01-19-2010, 03-04-2010
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. **Claims 52-55, 59-71 and 74-76** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions/species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 07-13-2009.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 56-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schell et al (US 5952110) in view of Koizumi et al (EP1035231, as supplied by applicant).

The instant **claim 56** is directed towards a method for producing a surface treated component of a turbine engine, comprising:

- a. Applying a compressed powder of a mixture including one or more oxidation-resistant metals and one or more ceramic materials as a tool electrode, and
- b. Forming a protective coating on a portion of an untreated component by processing the portion as a workpiece of an electric spark machine with the tool electrode

Schell et al is directed towards a method for forming a protective (and abrasive/wear resistant) coating on a gas turbine engine component (abstract). The method comprises depositing a layer of an oxidation resistant metal alloy, then depositing a composite layer of (1) an oxidation resistant metal, such as a NiCr (e.g. NiCrCoAl) alloy **12** and (2) abrasive particles (col 5, line 34-46). The abrasive particles **16** in the composite layer can be ceramics, such as alumina (col 5, lines 25-34) and Schell et al teaches the use of other abrasives material, such as cubic boron nitride, as common, with materials that last through the green run of the engine as preferred (col 1, line 61 through col 2, line 4). Schell et al does not teach depositing this composite layer by an electric spark machine process.

However, Koizumi et al is also directed towards a process for depositing wear resistant coatings. It teaches that electrospark alloying (ESA) methods are known to be suitable for the deposition of such coatings. This method works by creating a spark between the substrate and a tool electrode formed of the material to be deposited, so that material from the electrode transfers to the substrate and forms a coating [0002].

Koizumi et al further teaches forming an electrode by mixing powders of the materials to be deposited. This should include at least one metal from a list which includes: Ni, Co, Cr and Al. The powder mixture is compressed and treated in order to form an axial body, which is the tool electrode [0010]. In addition to the metal powder, abrasive powders, such as cubic BN, is added to the powder mixture in order to increase its wear resistance [0023].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to deposit the NiCr alloy/Alumina composite coating of Schell et al by an ESA process as taught by Koizumi et al by: mixing NiCr Alloy powder with alumina powder and forming it into a tool electrode, and generating a spark between the electrode and the substrate so that the substrate is coated. Such a person would have been motivated to do so, since it was a known deposition method to be suitable for the formation of such protective coatings and would produce predictable results (**claims 56 and 57**)

Regarding **claim 58**, Schell et al further teaches depositing an additional ceramic layer **14** over the composite metal/ceramic layer (which can be considered to comprise a protective metal coating portion **12** and a second $\text{ZrO}_2\text{-Y}$ portion **16**, see figure 1) by a PVD process (col 5, lines 37-48), which further protects the substrate.

3. **Claims 72-73** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schell et al (US 5952110) in view of Koizumi et al (EP 1035231) in view of Kamo et al (US 4738227) in view of Church et al (US 3956531) .

These claims are directed towards a process for producing a surface treated portion of a turbine engine, comprising:

- a. Forming a base coating on a portion of an untreated component by processing the portion as a workpiece of an electric spark machine with a tool electrode of an oxidation resistant metal;

- b. Forming a protective coating coated on the base coating and the intermediate substance by processing the base coating and the intermediate substance as a workpiece of an electric spark machine with a tool electrode of one or more protective materials selected from the group consisting of oxide ceramics, scubic BN and oxidation-resistant metals; and
 - c. Closing pores of the protective coating by filling a powder of SiO_2 or MoSi_2 into the pores and heating the portions enough to change the powder into amorphous SiO_2 .
4. Schell et al is directed towards a method for forming a protective (and abrasive/wear resistant) coating on a gas turbine engine component (abstract). The process forms the structure shown in figure 1, and comprises:
- a. depositing a first layer of an oxidation-resistant NiCr metal alloy (e.g. NiCrCoAl) alloy (**claim 73**, col 5, lines 34-37), then
 - b. depositing a second protective layer comprising a NiCr alloy and an intermediate (abrasive) particle substance **16**, which has 40-70% of the particles size extending out of the NiCr alloy material (col 5, lines 36-41).
- Schell et al teaches a variety of abrasives as known to the art, like cubic boron nitride and alumina (col 1, lines 58-63). A ceramic material **14** is then deposited between the abrasive particles as part of this protective layer by plasma spraying (col 5, line 34-46). The ceramic is preferably made of a zirconia (col 4, lines 66-67) and it improves the durability and thermal stability of the underlying engine component (col 5, lines 6-12).

Schell et al does not teach depositing this first or second composite layer by an electric spark machine process. It also does not teach filling the pores in the zirconia coating with a SiO_2 powder and heating it to form amorphous SiO_2 .

However, Koizumi et al is also directed towards a process for depositing wear resistant coatings. It teaches that electrospark alloying (ESA) methods are known to be suitable for the deposition of such coatings. This method works by creating a spark between the substrate and a tool electrode formed of the material to be deposited, so that material from the electrode transfers to the substrate and forms a coating [0002]. This is done with a gas between to the substrate and the electrode (intermediate material) [0025].

Koizumi et al further teaches forming an electrode by mixing powders of the materials to be deposited. This should include at least one metal from a list which includes: Ni, Co, Cr and Al. The powder mixture is compressed and treated in order to form an axial body, which is the tool electrode [0010]. In addition to the metal powder, abrasive powders, such as cubic BN, is added to the powder mixture in order to increase its wear resistance [0023].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to deposit the first NiCr alloy coating of Schell et al by an ESA process as taught by Koizumi et al and then to deposit the first part of the second protective layer by mixing NiCr Alloy powder with alumina (metal oxide) or cubic BN powder and forming it into a tool electrode, and generating a spark between the electrode and the substrate so that the substrate is coated. The zirconia of the

second protective layer could then be deposited by plasma spray. Such a person would have been motivated to deposit these metal containing layers by the ESA process since it was a deposition method known to be suitable for the formation of such protective and abrasive coatings which would produce predictable results.

Kamo et al is directed towards combustion engines (abstract) and contains teaching highly relevant to the insulating zirconia coatings on such components. Like Schell et al it teaches plasma spraying zirconia coatings on its engine components as a thermal barrier (col 5, lines 40-45). Kamo et al additionally teaches that, in order to further increase the durability of the zirconia, coating the zirconia layer with a ceramic coating material comprising silica which is impregnated into the pores of the plasma sprayed zirconia with a liquid chromium precursor and then thermally treated to 1000°F so that it closes the pores in the zirconia (col 5, lines 45-63). Since it does not say that the resulting silica is crystalline, so a person of ordinary skill in the art would expect that amorphous silica (glass) would be used. Furthermore after the heat treatment the resulting silica would be glassy (amorphous). Kamo et al incorporates the Church et al reference (US 3956531) in order to teach how the silica containing coating is used (col 5, lines 64-66), but Kamo et al itself does not specifically state that the silica is in the form of a powder.

The Church et al reference teaches that when the liquid chromium composition contains additional oxides, they are in the form of particulate powders which are mixed into a slurry which is then applied to the substrate surface (col 29, line 67 through col 30, line 61).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to apply such a silica powder containing coating to the plasma sprayed coating of Schell et al in order to increase the durability of the zirconia layer, which, as shown above, Schell teaches is important to the zirconia layer.

When a reference discloses the limitations of a claim except for a property, and the Examiner cannot determine if the reference inherently possesses that property (in this case, that the heat treated silica would be amorphous), the burden is shifted to Applicant(s). In re Fitzgerald, USPQ 594 and MPEP §2112 (**claim 72**).

Response to Arguments

5. Applicant's arguments filed December 18th, 2009 have been fully considered but they are not persuasive.

In response to applicant's arguments that Schell does not teach using an electric spark machine, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to applicant's argument that Koisumi is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir.

1992). In this case, Koizumi et al, like applicant, is directed towards an electric spark deposition process for depositing protective coatings which can include a mixture of ceramics and metal alloy onto a metal substrate. This is in applicant's field of endeavor and highly relevant to applicant's problem of how to deposit such protective coatings.

Applicant further argues that Koizumi does not use an "electric spark machine" to deposit their coatings, but something different. The applicant has not pointed out, nor can the examiner determine, what required features of an "electric spark machine" are missing in the electrosark alloying machine of Koizumi. The Koizumi et al machine generates electric sparks between a tool electrode and a substrate in order to transfer material from the tool electrode to the substrate [0038-0041], so it can be reasonably described as an electric spark machine.

Applicant's comparison is more difficult to understand because applicant cites definitions of different *processes* to indicate a difference in the structure of the *apparatus* that is claimed. Moreover, Koizumi et al is not just performing a general surface alloying process (as applicant appears to imply), but an **Electrosark** Surface Alloying (ESA) process, which requires a machine to produce the electric sparks, while surface alloying might be done without such a machine. For at least these reasons, this argument of applicant's is not convincing.

Finally, applicant argues that there is no motivation to impregnate silica powder into the pores of a plasma sprayed zirconia coating because a person of ordinary skill in the art would expect it to be suitable to fill the pores in zirconia

unless a plasma spray process is used. However, in the rejection as applied, the zirconia is applied by plasma spray and Kamo et al specifically teaches that their coating material, which comprises silica powder (as shown by Church) is suitable and desirable in turbine engine plasma sprayed coatings, so there is a motivation to use such a coating and the expectation of success. Furthermore, applicant has provided not evidence that silica powder would have been expected to be unsuitable, instead just arguing that it is so. For at least these reasons this argument is not convincing.

Conclusion

6. No current claims are allowed. Though they have not been cited in the present rejection, Suzuki et al (US 4948625) and Inoue (US 4556775) are considered relevant to the patentability of these claims.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792